



Exploring The Incorporation Of Biophilic Design Features In Orthopedic Hospitals To Accelerate Recovery

Ekpo, Nse-Obong

Department of Architecture,
Faculty of Environment Sciences,
Nnamdi Azikiwe University, Awka, Anambra State, Nigeria.

ABSTRACT

In the realm of healthcare design, the integration of biophilic design principles has emerged as a promising avenue to enhance patient outcomes and well-being. This article delves into the exploration of incorporating biophilic design features within orthopedic hospitals, with a specific focus on expediting the recovery process. Through an in-depth examination of existing research, case studies, and literature reviews, the study seeks to unravel the profound impact of nature-inspired elements on the physical and psychological healing of orthopedic patients. The investigation underscores the potential benefits of biophilic design, such as increased patient satisfaction, reduced stress levels, and accelerated recovery rates. By examining successful implementations of biophilic design in orthopedic healthcare settings, the article aims to provide evidence-based insights into the positive effects on pain management, mobility, and overall patient experience. Furthermore, the article advocates for a holistic approach to hospital design that encompasses not only the functional aspects of medical facilities but also the crucial role of the healing environment. The synthesis of architectural elements, natural light, greenery, and other biophilic features is presented as an innovative strategy to create therapeutic spaces that contribute to a more conducive healing environment for orthopedic patients. This exploration seeks to inspire healthcare professionals, architects, and stakeholders in the healthcare industry to consider biophilic design as an integral component of hospital planning, particularly within orthopedic specialties. Ultimately, the article aspires to contribute to the ongoing dialogue on enhancing healthcare environments to foster holistic healing and improved patient outcomes.

Keywords: Biophilic Design, Orthopedic hospitals, Patient recovery, Healing environment, Healthcare design, Nature-inspired elements, Patient satisfaction

INTRODUCTION

Traditionally, healthcare design has focused primarily on functionality and efficiency, often overlooking the profound influence of the built environment on patient well-being. However, the pursuit of optimizing healthcare environments for patient well-being has driven recent advancements in healthcare design, leading to the incorporation of innovative design strategies (Ulrich, 1997). This focus on patient-centered design has become a central theme in healthcare research and development. Among these approaches, the integration of Biophilic Design principles has gained prominence for its potential to positively impact patient outcomes and accelerate recovery (Kellert, 2008).

Orthopedic hospitals are adapting to the evolving healthcare landscape, focusing on innovative strategies for improved outcomes (Fleury, Goldchmit, Gonzales, de Farias, & Fernandes, 2022). In Nigeria, where demand for specialized orthopedic care is rising, exploring novel design approaches is imperative. These hospitals, tailored for musculoskeletal conditions, are pivotal in Nigeria's healthcare infrastructure (Owoloyi, n.d.). With an increasing prevalence of orthopedic ailments, reevaluating the physical environments for patient treatment and recovery is essential (Beveridge & Howard, 2004). Biophilic design, rooted in the human connection to nature, which has evolved over millennia, emerges

as a compelling avenue to reshape clinical spaces and foster healing (Kellert, Heerwagen, & Mador, 2011).

Exposure to natural elements, such as plants, daylight, water features, and natural materials, has been shown to promote physical and psychological well-being (Hartig et al., 2010). In healthcare settings, biophilic design can contribute to stress reduction, pain management, and improved mood, ultimately leading to faster recovery rates (Kellert & Calabrese, 2015). While extensive research has expounded upon the general application of biophilic design in healthcare contexts, a conspicuous gap exists in the specialized domain of orthopedic hospitals, spaces where individuals confront the intricate challenges of musculoskeletal disorders.

Orthopedic patients grapple with physical discomfort and protracted convalescence. Patients undergoing surgeries and rehabilitation often experience pain, anxiety, and emotional distress (Vincent, Horodyski, Vincent, Brisbane, & Sadasivan, 2015). Biophilic elements can help to alleviate these symptoms by providing a sense of calm and tranquility, fostering a more conducive environment for healing (Kellert & Calabrese, 2015). The architectural embodiment of nature within these hospital spaces could be a key variable in optimizing the healing trajectory for individuals navigating the intricate landscapes of orthopedic treatment. Understanding how specific Biophilic Design Features can be tailored to the unique needs of orthopedic patients holds promise for revolutionizing recovery experiences.

Aim

This study aims to evaluate the benefits of incorporating biophilic design in Nigerian orthopedic hospitals, exploring how elements like natural light and greenery can positively impact patient outcomes and expedite the recovery process in orthopedic care. The research seeks to guide evidence-based practices for creating a healing environment that expedites the recovery process in orthopedic care.

RESEARCH METHODOLOGY

Qualitative research method was used for this study, this involved a combination of case studies and in-depth literature reviews. The selected case studies were analyzed to identify patterns, themes, and key success factors related to the integration of biophilic design in orthopedic hospital settings. A comprehensive literature review on existing studies, articles, and reports related to biophilic design in healthcare environments, was also conducted with a specific focus on orthopedic hospitals.

FINDINGS

Biophilic design is proving instrumental in enhancing patient outcomes within orthopedic hospitals. Noteworthy findings by (Ulrich, 1984) indicate that patients exposed to natural light during their orthopedic hospital stay experienced shorter recovery times and less pain. Similarly, incorporating indoor greenery, as observed by Dijkstra, Pieterse, & Pruyn, (2008), has demonstrated a positive impact on patient well-being, with lower levels of stress and anxiety reported in rooms with plants compared to plant-free environments.

Studies investigating the integration of natural elements within orthopedic hospital environments reveal compelling insights. Presence of water elements, such as indoor fountains or aquariums, contributes to a calming atmosphere, potentially reducing patient stress (Clouse, 2016). Patients with access to nature views reported higher satisfaction levels, perceiving a more positive hospital experience (Ulrich, 1984). Furthermore, the layout and design of orthopedic hospital spaces play a pivotal role in patient well-being. Incorporating natural materials in architectural design positively influences emotional states (Ryan, Browning, Clancy, Andrews, & Kallianpurkar, 2014). Arranging spaces to facilitate easy access to outdoor areas has been associated with increased patient mobility and engagement in rehabilitation activities, potentially expediting the recovery process (Tekin & Urbano Gutiérrez, 2023). The impact of biophilic design extends beyond patient outcomes to staff satisfaction and well-being, positively influencing the overall effectiveness of orthopedic hospitals (Ulrich et al., 2004).

Biophilic Design Principles

Stephen Kellert, a prominent advocate for biophilic design, established six key principles that provide a practical framework for incorporating nature into projects. The first principle, Environmental Features, involves integrating natural elements like vegetation, water, sunlight, and natural materials for a visually and tactilely pleasing experience. Natural Shapes and Forms, the second principle, focuses on using naturally occurring shapes and patterns, creating symbolic connections to nature.

The third principle, Natural Patterns and Processes, incorporates structures and laws found in the natural world, stimulating senses with evolving materials. Light and Space, the fourth principle, emphasizes the importance of daylighting, varied lighting, and diverse interior volumes to mimic outdoor experiences. Place-Based Relationships, the fifth principle, encourages rooting projects in local contexts, using indigenous materials and capturing the essence of the surroundings. The final principle, Evolved Human-Nature Relationships, centers on recreating sensations from our evolutionary connection to nature within the built environment, including feelings of protection, awe, order, and exploration. Integrating these principles early in the design process fosters a more impactful and emotionally connected project (Kellert & Calabrese, 2015).

Early incorporation of these principles in the design process, as advocated by Kellert and his colleagues, facilitates the creation of projects that extend beyond mere functionality. By prioritizing Environmental Features, Natural Shapes and Forms, and Natural Patterns and Processes, designers lay the groundwork for projects that not only meet functional needs but also establish emotional connections and resonate deeply with occupants.

Biophilic design transforms patient well-being, enhances healthcare outcomes, and creates healing environments for orthopedic care. The following real-world examples showcase its successful implementation in orthopedic hospitals globally:

The Christ Hospital Joint and Spine Center, Cincinnati, Ohio, United States

The Christ Hospital Joint and Spine Center is a new model for integrated, patient-centered orthopedic care. Located in Cincinnati, Ohio, the 381,000-square-foot, seven-story facility houses approximately 90 inpatient rooms and 12 surgical suites. The center opened in September 2015 and was designed by SOM.

Externally, the red brick and limestone exterior pays homage to the surrounding neighborhood's vernacular architecture. The architectural design includes a projected "lantern" that accentuates the main entrance, offering a contemporary reinterpretation of the historic campus cupola. A site master plan ensures efficient circulation, and a new north-south alignment facilitates potential campus expansion to the south. The building is designed to promote healing and well-being. It features floor-to-ceiling windows that let in natural light, flexible semi-public spaces that offer a place of respite for caregivers and families, and patient rooms that are organized and furnished to provide a soothing environment. The center also incorporates biophilic design elements, such as plants and natural materials, which have been shown to improve patient outcomes ("The Christ Hospital," 2016).

Tanaka Orthopedic Clinic, Shizuoka, Japan

In the tranquil outskirts of Shizuoka, Japan, an orthopedic surgery clinic harmoniously integrates with its natural surroundings, guided by the concept of 'persistent greenery.' Designed by Akiyoshi Takagi & Associates, the single-story structure strategically occupies a key intersection, ensuring heightened visibility for both drivers and pedestrians, effectively enhancing the clinic's accessibility. Encircling the clinic is a verdant belt, serving as a lush buffer zone that shields the building from the hustle of passing vehicular traffic. Under the gently angled roof, the interior spaces are meticulously arranged based on their functions, with areas requiring greater ceiling clearance thoughtfully juxtaposed against more intimate sections like examination rooms ("Akiyoshi Takagi," 2015).

Notably, extended eaves not only delineate distinct spaces for arrivals and departures but also foster a sense of community beneath the expansive roof canopy. Central to the design philosophy is the incorporation of a tree-lined garden, strategically positioned to offer solace and comfort to individuals awaiting the company of friends or family within the clinic's confines. This thoughtful integration of biophilic design principles, epitomized by the seamless blending of architecture and nature, transforms the clinic into a healing sanctuary. The utilization of 'persistent greenery' not only establishes a visual connection with the natural landscape but also contributes to the overall well-being of patients, creating an environment conducive to both physical and emotional recovery ("Tanaka Clinic," 2014).

National Orthopaedic Hospital, Igbobi, Lagos state, Nigeria

The National Orthopaedic Hospital, Igbobi, situated along the bustling Ikorodu Road in Lagos, has a rich history dating back to its origins as a Military Rehabilitation Camp for World War II prisoners of war. Recognized by the Colonial Medical Services in 1945, it evolved into the Igbobi Orthopaedic Hospital, underwent subsequent name changes to Royal Orthopaedic Hospital, and eventually became

the National Orthopaedic Hospital. Over the years, the hospital experienced shifts in governance, transitioning between Federal and Lagos State administration until it solidified its status as a Federal Government health institution in 1977.

With the capacity to accommodate up to 450 patients, the hospital played a significant role in the early days, extending its influence beyond Nigeria to other parts of the West African Sub-region, Central Africa, and Angola. Not only did it serve as a crucial healthcare facility, but it also functioned as a repository of materials and resources for students.

The hospital's historical journey reflects its resilience and adaptability to changing healthcare landscapes. In recent years, the National Orthopaedic Hospital, Igbobi, has embraced modern design approaches, including the incorporation of biophilic design principles. This innovative design philosophy integrates natural elements into the hospital environment, fostering a connection with nature to enhance patient well-being and overall healthcare outcomes. Patients now experience a healing atmosphere that goes beyond the conventional medical setting, highlighting the hospital's commitment to evolving healthcare practices and the well-being of those in its care ("About-NOHIL - National Orthopaedic Hospital - Lagos," n.d.).

CONCLUSION

The integration of biophilic design features in orthopedic hospitals offers a promising avenue for enhancing patient outcomes and expediting the recovery process in Nigeria. The escalating demand for specialized orthopedic care and the dynamic healthcare landscape underscore the critical need for innovative design approaches. As orthopedic hospitals play a pivotal role in addressing musculoskeletal conditions within the country's healthcare infrastructure, the exploration and implementation of biophilic design principles can significantly contribute to reshaping clinical spaces. The evidence from global studies, coupled with the foundational work of Ulrich and Kellert, highlights the positive impact of biophilic elements on patient well-being and recovery rates. Recognizing the increased prevalence of orthopedic ailments in Nigeria, a strategic reevaluation of the physical environments within these hospitals is essential. Biophilic design, with its emphasis on natural light, greenery, and connections to nature, provides a holistic approach to fostering healing environments for orthopedic patients.

RECOMMENDATIONS

Orthopedic hospitals in Nigeria should strategically incorporate biophilic design principles into their architectural plans to optimize patient well-being. Specifically, these hospitals are advised to:

- **Maximize Natural Light:** Prioritize abundant natural light in patient areas for a positive impact on mood and a healing environment.
- **Integrate Indoor Greenery:** Incorporate plants to reduce stress and create a calming atmosphere throughout hospital spaces.
- **Provide Views of Nature:** Design spaces with views of nature, promoting a sense of connection to the natural environment.
- **Foster Collaboration:** Encourage collaboration between architects and healthcare professionals to tailor biophilic design features to orthopedic patients' specific needs.
- **Conduct Longitudinal Studies:** Undertake research to assess the long-term impact of biophilic design on patient outcomes in orthopedic hospitals.
- **Raise Awareness:** Implement education initiatives to raise awareness about the positive effects of biophilic design among healthcare providers and the public, fostering support for its integration in healthcare settings.

These recommendations, when implemented thoughtfully, have the potential to transform the physical environments of orthopedic hospitals in Nigeria, contributing to enhanced patient outcomes and a more positive healthcare experience.

REFERENCES

About-NOHIL - National Orthopaedic Hospital - Lagos. (n.d.). Retrieved from <https://www.nohlagos.gov.ng/about.html>

- Akiyoshi takagi arranges orthopedic clinic around urban greenery. (2015, March 3). Retrieved from <https://www.designboom.com/architecture/akiyoshi-takagi-associates-tanaka-clinic-shizuoka-japan-11-17-2014/>
- Beveridge, M., & Howard, A. (2004). The Burden of Orthopaedic Disease in Developing Countries. *The Journal of Bone and Joint Surgery-American Volume*, 86(8), 1819–1822. <https://doi.org/10.2106/00004623-200408000-00029>
- Clouse, A. M. (2016). Human Psychological Response to and Benefits of Interior Water Features.
- Dijkstra, K., Pieterse, M., & Pruyn, A. (2008). Stress-reducing effects of indoor plants in the built healthcare environment: The mediating role of perceived attractiveness. *Preventive Medicine*, 47(3), 279–283. <https://doi.org/10.1016/j.ypmed.2008.01.013>
- Fleury, A. L., Goldchmit, S. M., Gonzales, M. A., de Farias, R. R., & Fernandes, T. L. (2022). Innovation in Orthopedics: Part 1—Design Thinking. *Current Reviews in Musculoskeletal Medicine*, 15(2), 143–149. <https://doi.org/10.1007/s12178-022-09748-5>
- Hartig, T., van den Berg, A. E., Hagerhall, C. M., Tomalak, M., Bauer, N., Hansmann, R., . . . Waaseth, G. (2010). Health Benefits of Nature Experience: Psychological, Social and Cultural Processes. *Forests, Trees and Human Health*, 127–168. https://doi.org/10.1007/978-90-481-9806-1_5
- Kellert, S. R., Heerwagen, J., & Mador, M. (2011). *Biophilic Design*. John Wiley & Sons.
- Kellert, Stephen. (2008). Dimensions, elements, and attributes of biophilic design. *Biophilic Design*. 3-20.
- Kellert, Stephen & Calabrese, Elizabeth. (2015). *The Practice of Biophilic Design*.
- National Orthopaedic Hospital Igbobi, Lagos in the city Lagos. (n.d.). Retrieved from <https://ng.worldorgs.com/catalog/lagos/hospital/nationalorthopaedichospitaligbobilagos>
- Owoloyi, P. (n.d.). Orthopaedic Practice In Nigeria, A C-Help Perspective. Retrieved from <https://www.rehabeledge.ng/posts/21-st-centur-orthopaedic-practice-in-nigeria-a-c-help-perspective>
- Ryan, C. O., Browning, W. D., Clancy, J. O., Andrews, S. L., & Kallianpurkar, N. B. (2014). BIOPHILIC DESIGN PATTERNS: Emerging Nature-Based Parameters for Health and Well-Being in the Built Environment. *International Journal of Architectural Research: ArchNet-IJAR*, 8(2), 62. <https://doi.org/10.26687/archnet-ijar.v8i2.436>
- Tanaka Clinic / Akiyoshi Takagi & Associates (2014, November 25). Retrieved from <https://www.archdaily.com/568649/tanaka-clinic-akiyoshi-takagi-and-associates>
- Tekin, B. H., & Urbano Gutiérrez, R. (2023). Human-centred health-care environments: a new framework for biophilic design. *Frontiers in Medical Technology*, 5. <https://doi.org/10.3389/fmedt.2023.1219897>
- The Christ Hospital Joint and Spine Center / SOM (2016, March 10). Retrieved from <https://www.archdaily.com/783542/the-christ-hospital-joint-and-spine-center-som>
- Ulrich, R. S., Zimring, C., Quan, X., Joseph, A., & Choudhary, R. (2004). The Role of the Physical Environment in the Hospital of the 21st Century: A Once-in-a-Lifetime Opportunity (pp. 1–69). *The Center for Health Design*.
- Ulrich, R. S. (1984). View Through a Window May Influence Recovery from Surgery. *Science*, 224(4647), 420–421. <https://doi.org/10.1126/science.6143402>
- Ulrich, Roger. (1997). A theory of supportive design for healthcare facilities. *Journal of healthcare design : proceedings from the ... Symposium on Healthcare Design*. Symposium on Healthcare Design. 9. 3-7; discussion 21.
- Vincent, H. K., Horodyski, M., Vincent, K. R., Brisbane, S. T., & Sadasivan, K. K. (2015). Psychological Distress After Orthopedic Trauma: Prevalence in Patients and Implications for Rehabilitation. *PM&R*, 7(9), 978–989. <https://doi.org/10.1016/j.pmrj.2015.03.007>